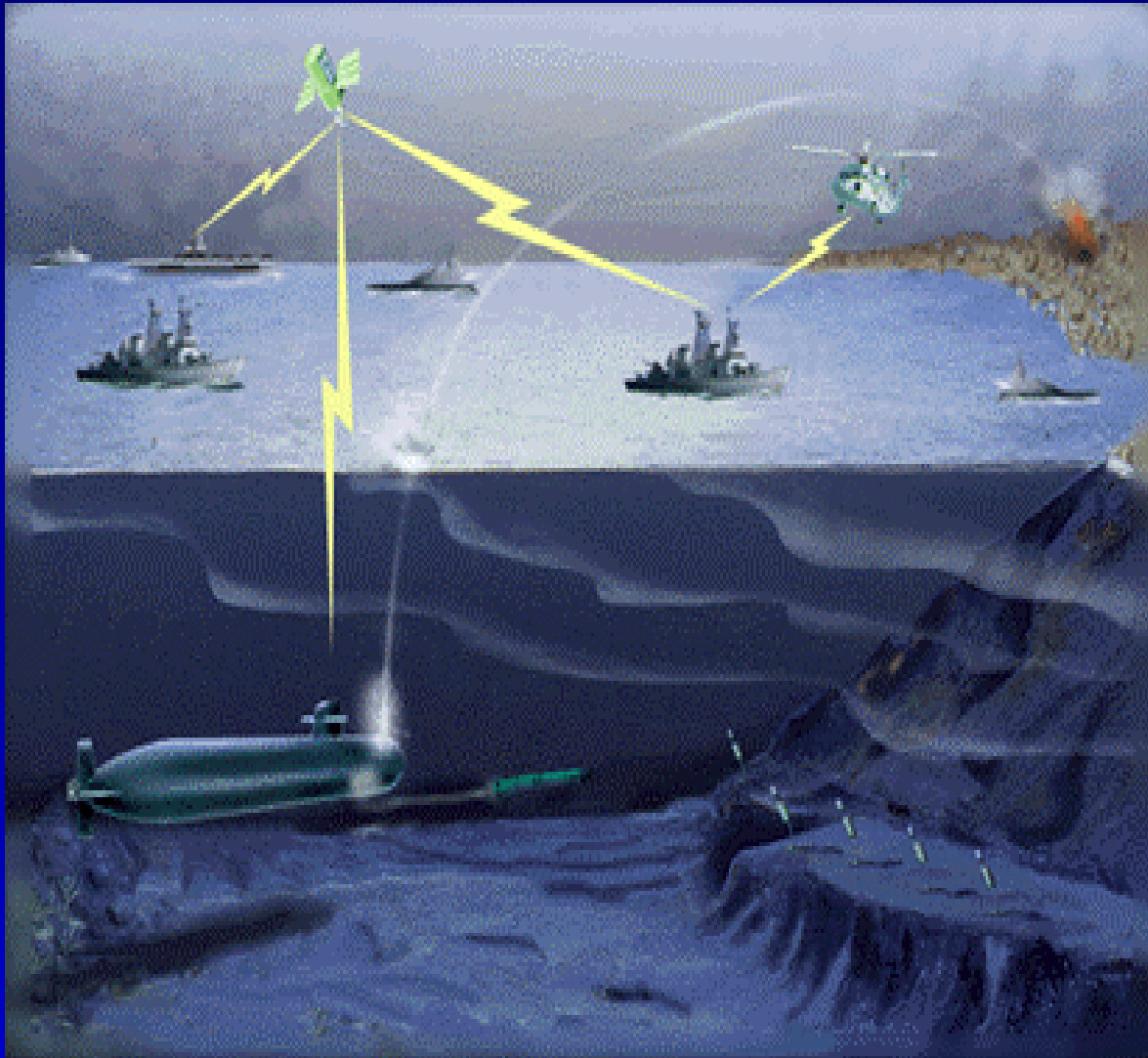


# ASW Process Description

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NUWC DIVNPT  
(401) 832-3170  
[kelley.pk@npt.nuwc.navy.mil](mailto:kelley.pk@npt.nuwc.navy.mil)

# Tactical Control Capabilities for USW



- ◆ Mission Assignment
- ◆ Environment/Threat Definition
- ◆ Waterspace Allocation
- ◆ Platform Search Plan
- ◆ Battle Group Search Plan
- ◆ Search Process
- ◆ Search plan updates
- ◆ Detection prosecution
- ◆ Attack

# **Fleet Acoustic Sensor Performance Prediction ASW TDAs**

- SIIP\*: CV-TSC; TSC; CTF
- SPPFS/SIMAS\*: SQQ-89 (DD;DDG;CG)
- SFMPL\*: SSN; SSBN
- NITES II\*: CV; LPH; LPD; Regional Centers;  
Small Combatants
- GF MPL: Mobile MET Teams
- IMAT/PCIMAT: Knowledge Based Trainer
- ASAP/SPARS: Surveillance Ships
- AESS\*: FMS to Allies (Canada; Korea; NATO)

\* TCP Elements

**PRODUCT: AESS (NITES V)**  
**USER: ALLIES**  
**ASSETS: Shore Sites**  
**Surface Combatants**

**PRODUCT:** SIIP (SPPEDS/ICAPS)  
**USER:** AW/AG/ASWC  
**ASSETS:** TSC / CV-TSC/Theater

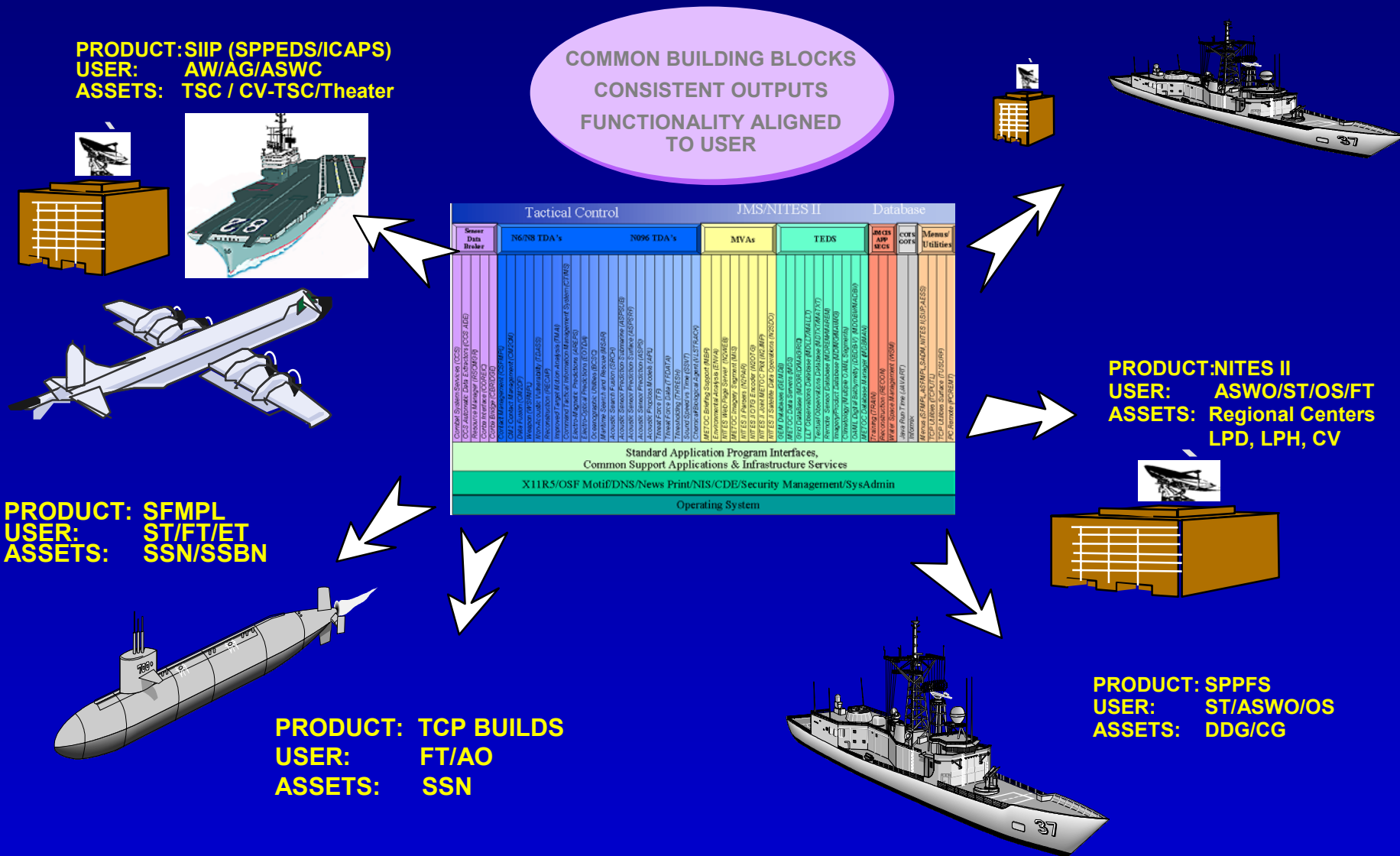
**COMMON BUILDING BLOCKS  
CONSISTENT OUTPUTS  
FUNCTIONALITY ALIGNED  
TO USER**

**PRODUCT:** NITES II  
**USER:** ASWO/ST/OS/FT  
**ASSETS:** Regional Centers  
LPD, LPH, CV

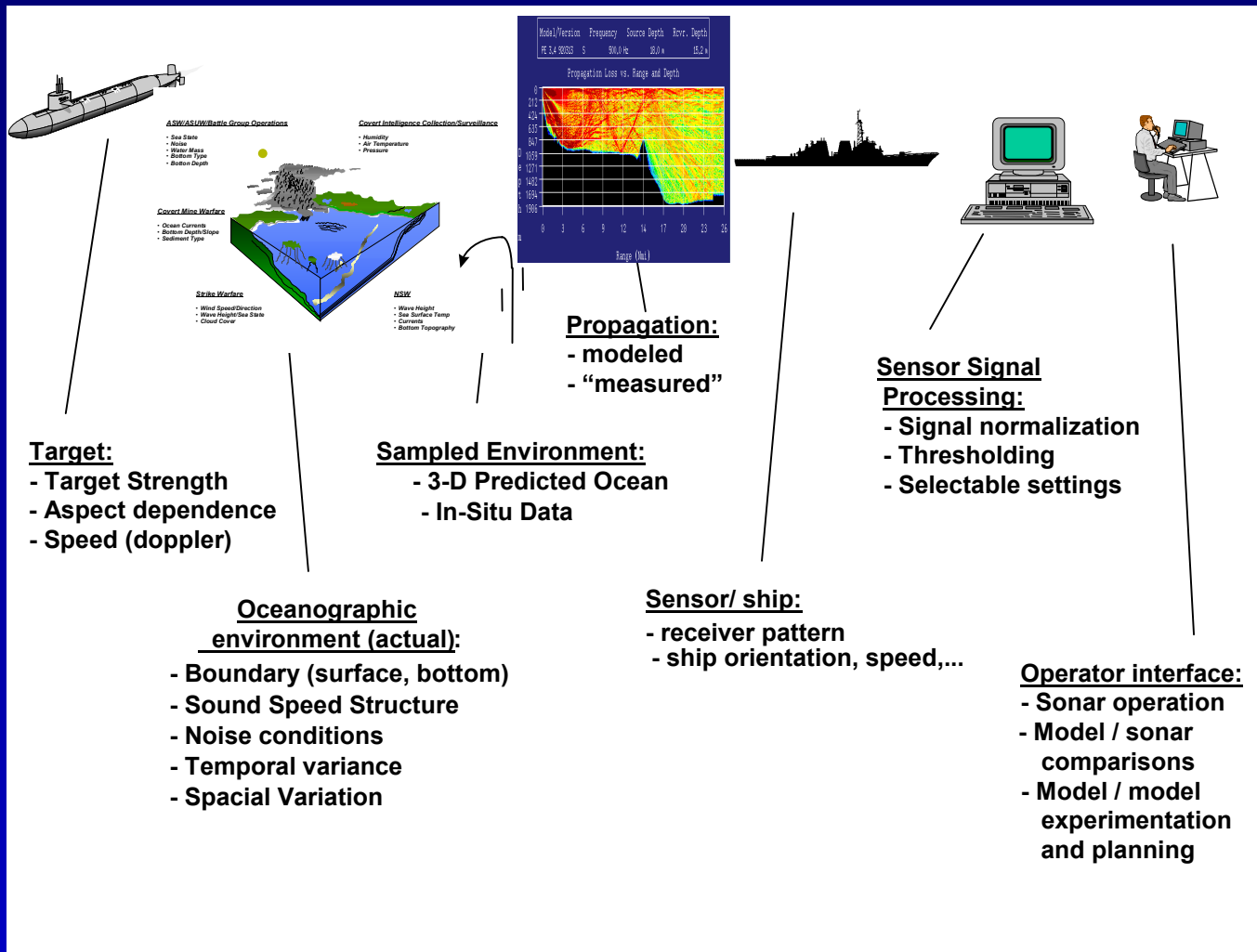
**PRODUCT: SFMPL**  
**USER: ST/FT/ET**  
**ASSETS: SSN/SSBN**

**PRODUCT: TCP BUILDS**  
**USER: FT/AO**  
**ASSETS: SSN**

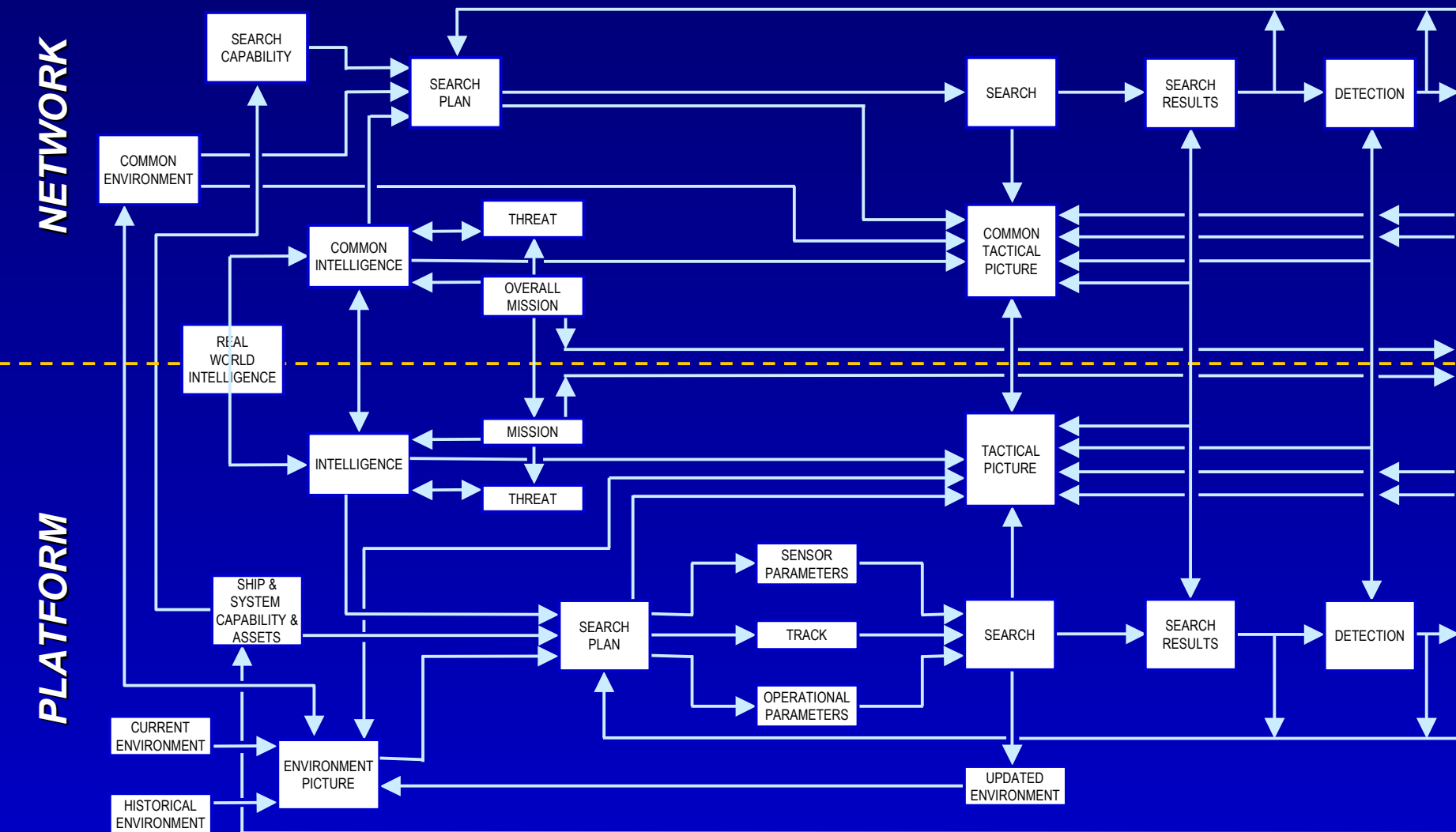
PRODUCT: SPPFS  
USER: ST/ASWO/OS  
ASSETS: DDG/CG



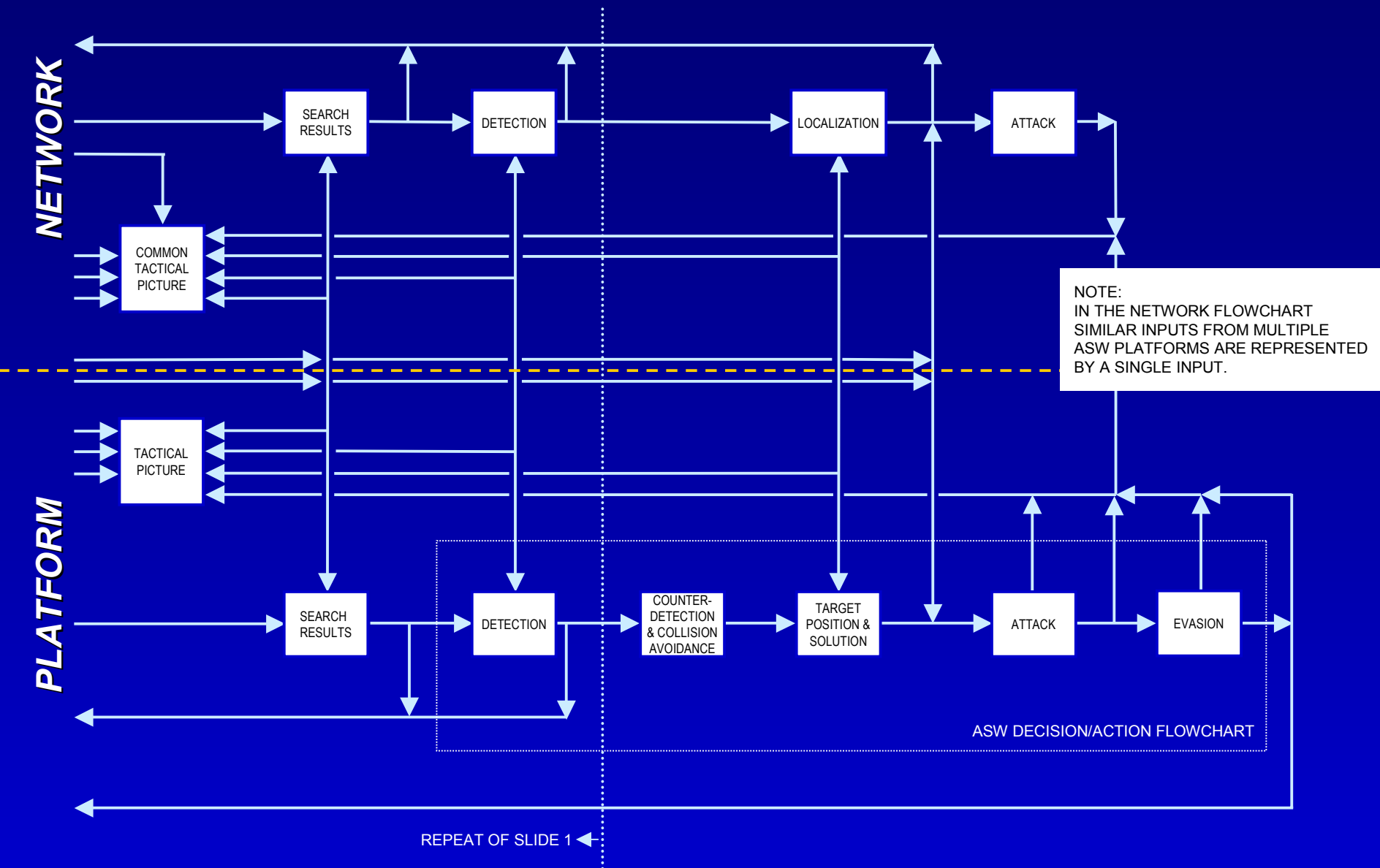
# Sensor Performance Prediction Issues



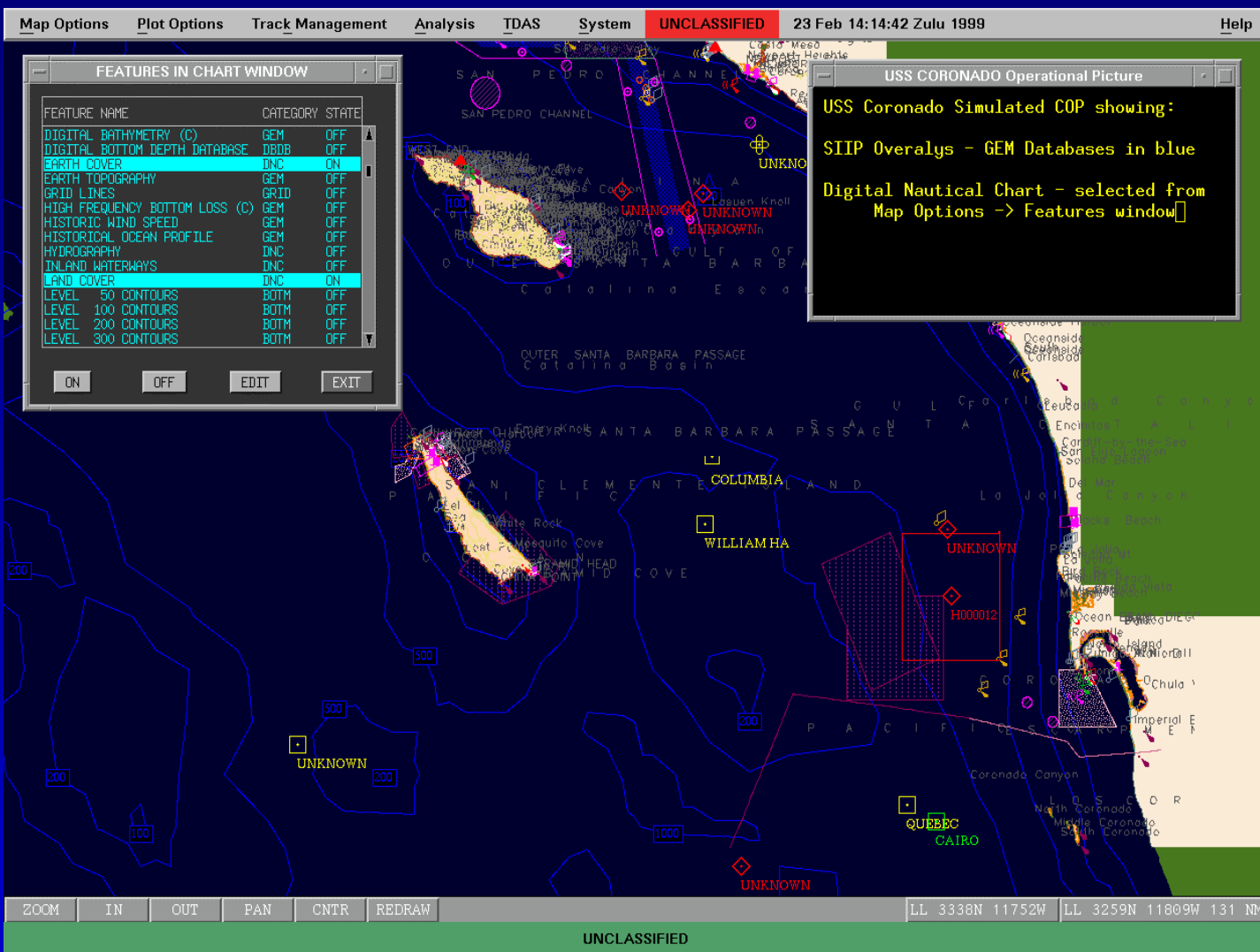
# Network Centric ASW Decision/Action Flowchart



# Network Centric ASW Decision/Action Flowchart



# (CM)2 Using DNC and SIIP Overlays

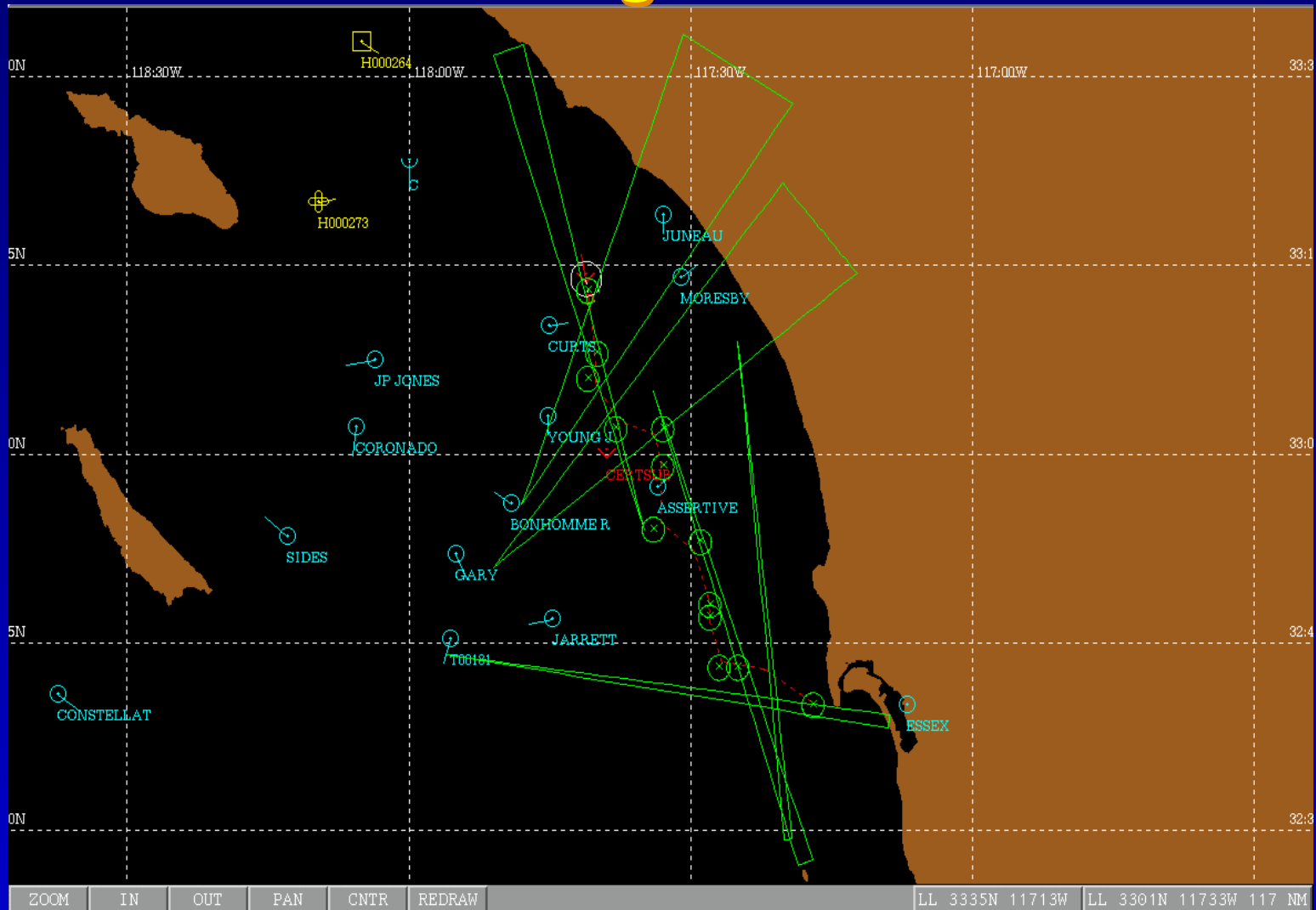




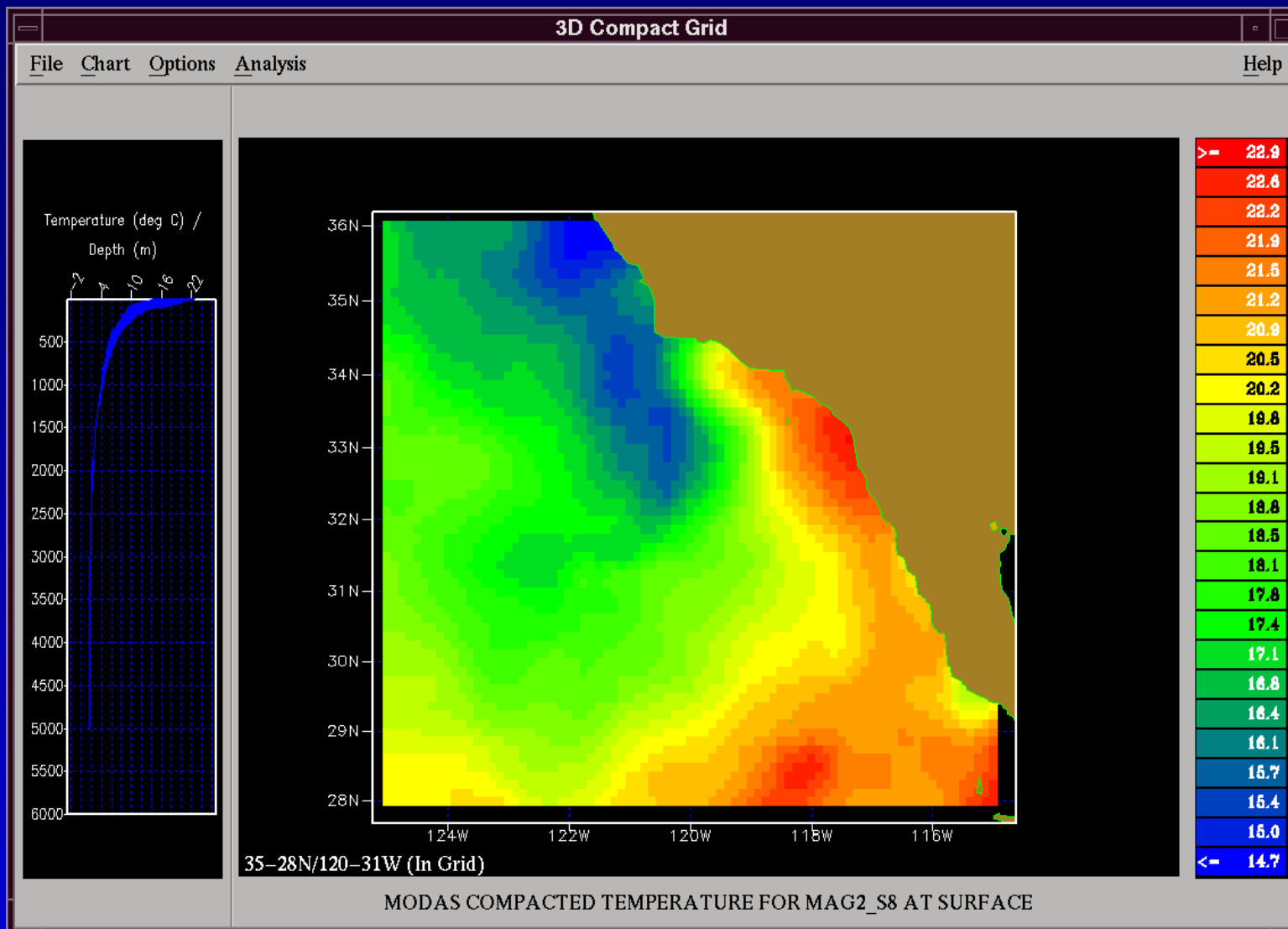
# (CM)2 Generated CTP

## From USS Coronado ASWC Anchor Desk

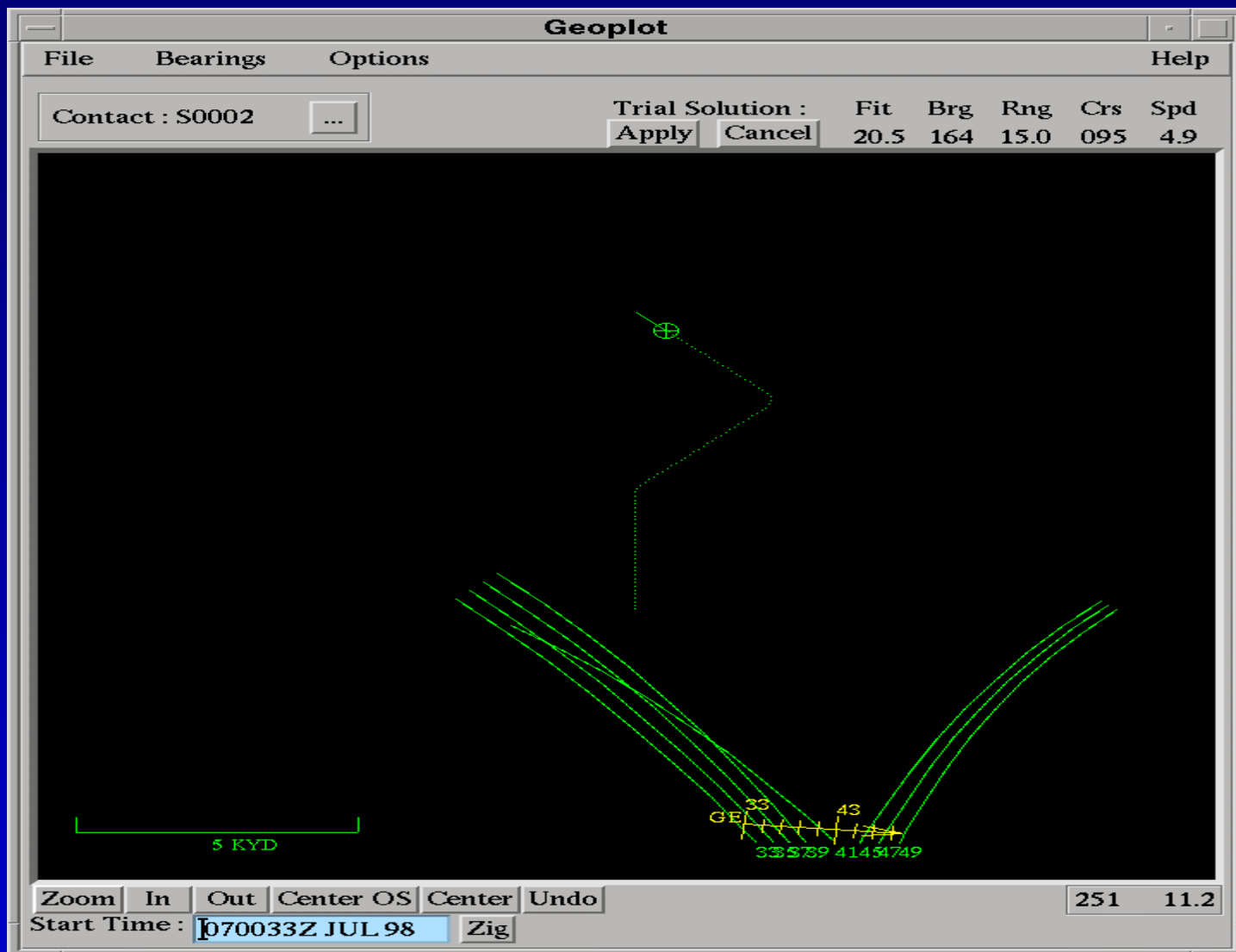
### During FBE-E



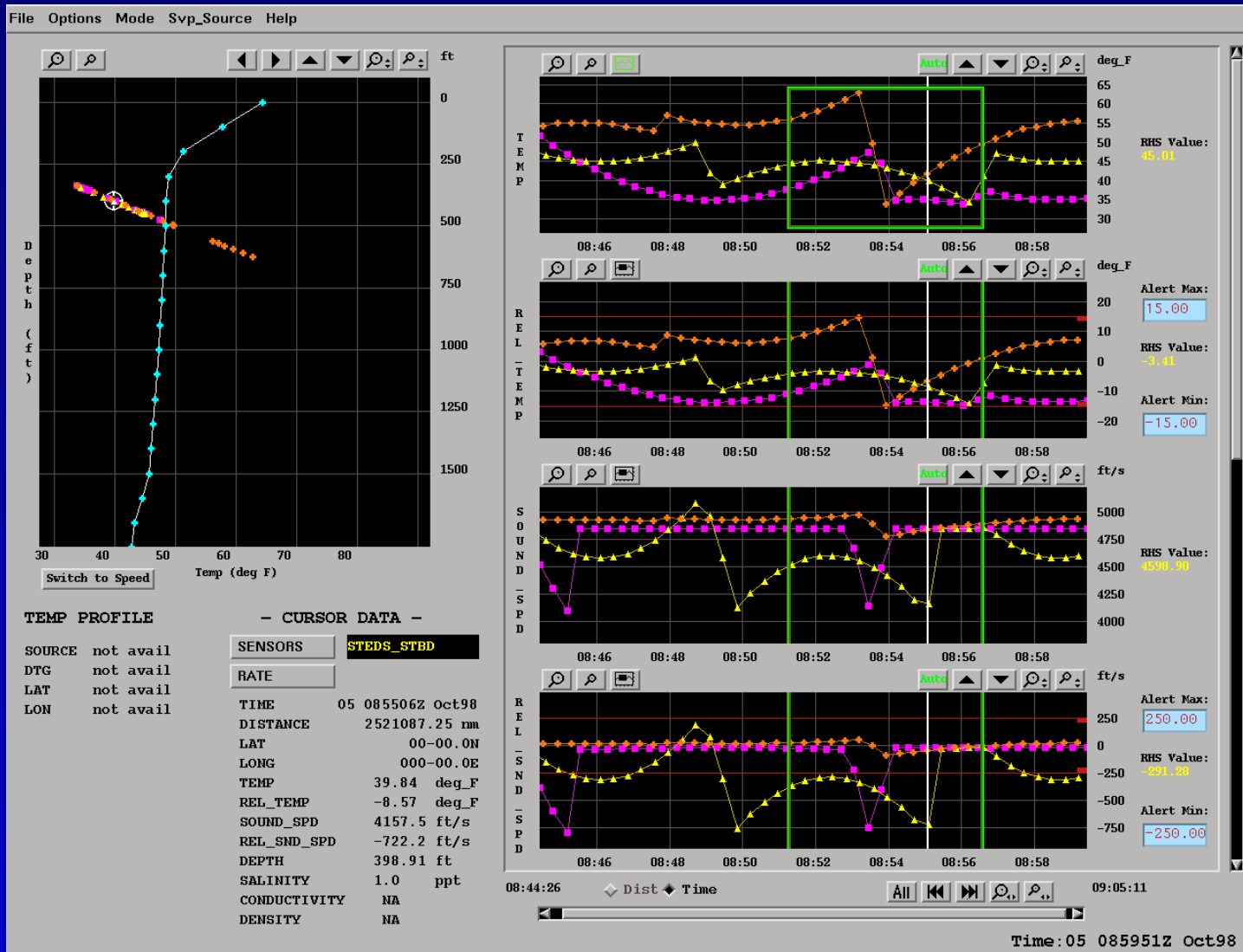
# MODAS



# GEOPLOT



# SSVT



# SSP

Environmental Editor

Files Edit Analysis More

Help

Lat : 33-47.9N

Long : 039-23.0W

DTG : 091838Z FEB96

Rain Rate : None

Wind Speed : 9.25 kts

Sea State : 2

MGS : 2

Bottom Depth : 10806.2 ft

Type :

Units : Feet/Degrees F

Profile : Full

Table : Hold Salin

Graph : Depth/Speed

Plot : Non-Merged

Remarks :

Depth Temp Speed Sal

1	0.0	64.5	4981.3	36.4
2	74.6	64.8	4984.2	36.4
3	160.6	65.1	4987.0	36.4
4	240.9	64.9	4987.6	36.4
5	338.4	64.7	4987.9	36.4
6	395.8	63.7	4983.6	36.4
7	466.3	62.7	4979.6	36.4
8	579.3	62.3	4979.3	36.4
9	676.8	62.2	4979.6	36.3
10	848.9	61.1	4976.5	36.3
11	987.5	59.9	4972.2	36.3
12	1089.8	59.6	4972.2	36.3
13	1233.2	58.5	4967.9	36.3
14				
15				

NON-MERGED PROFILE

Shallow Speed

Layer Depth 338 ft

DSCA 579 ft

Crit Depth none ft

Dep Excess none ft

Update System

Merge

Cancel



# Platform Sensor Editor

Platform/Sensor Editor

File Sensor Help

SUMMARY PLATFORM NON-ACOUSTIC PASSIVE NB PASSIVE BB TARGET STRENGTH SENSOR ATTACH

Name:  
 Class:  
 Country:  
 NTDS Type:  
 Source:  
 P-Masker: Off  
 Aspect: Beam (Mean)  
 Platform: Threat

Primary Active Sensor: None  
 Primary Passive Narrowband Sensor: None  
 Primary Passive Broadband Sensor: None

Emitter Sensors: Antenna Height (Ft):  
 Jammer Sensors: Antenna Height (Ft):  
 Receiver Sensors: Antenna Height (Ft):

Target Strength		Radar Cross Section	
Freq (KHz)	TS (dB)	Freq (GHz)	RCS (Sqm)
0.0		0.0	

Current Max Trans Patrol P-Scope  
 Speed (Kts): 0.0  
 Depth (Ft): 0.0

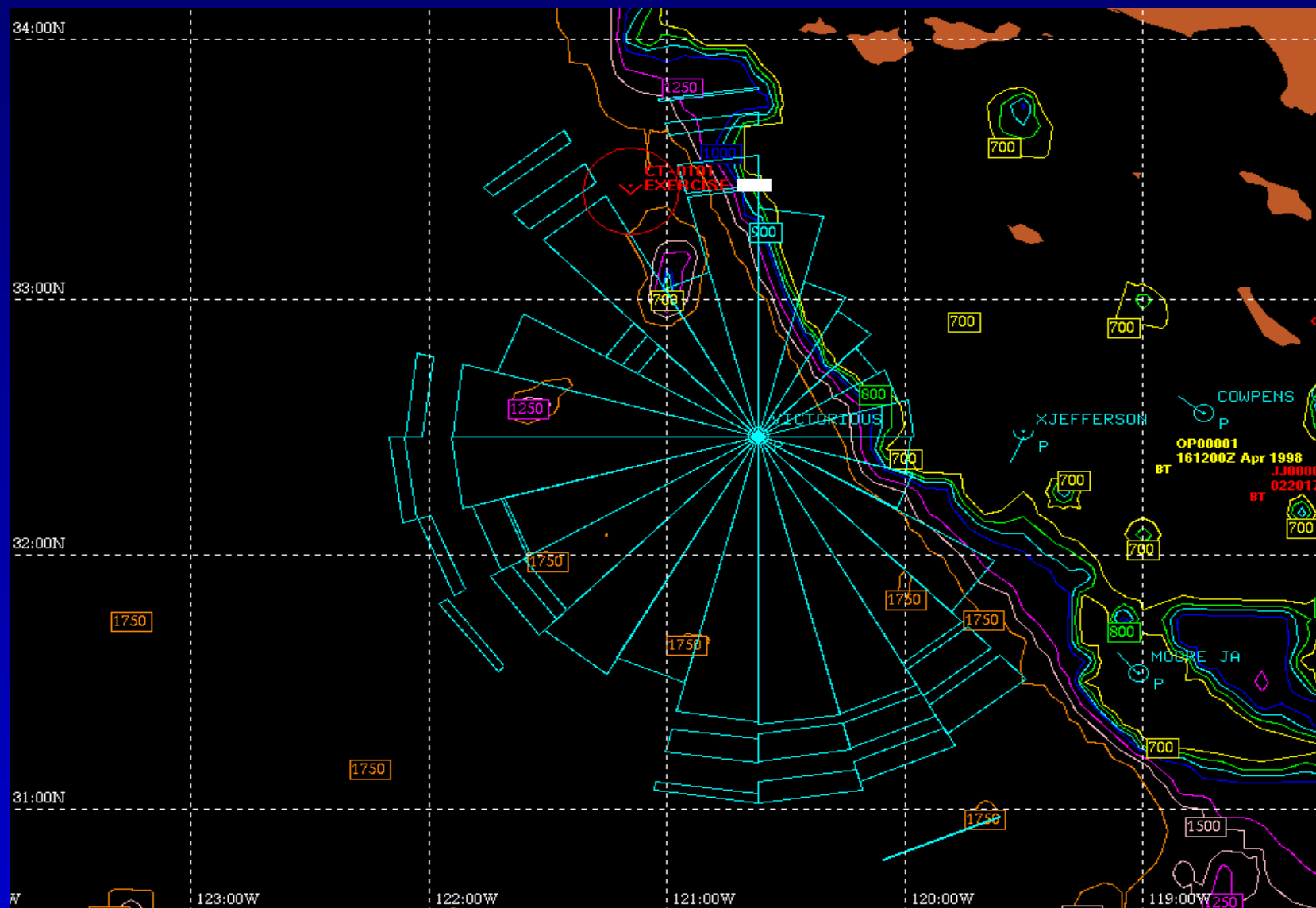
Length (Ft) Draft (Ft) Beam (Ft) Disp (Tons)

Update System

dB / 1 uPa / Hz  
 150.0  
130.0  
110.0  
90.0  
70.0  
 0.0 4000.0 8000.0 12000.0 16000.0 20000.0  
 Frequency (Hz)  
 Horiz = Broadband Vert = Narrowband



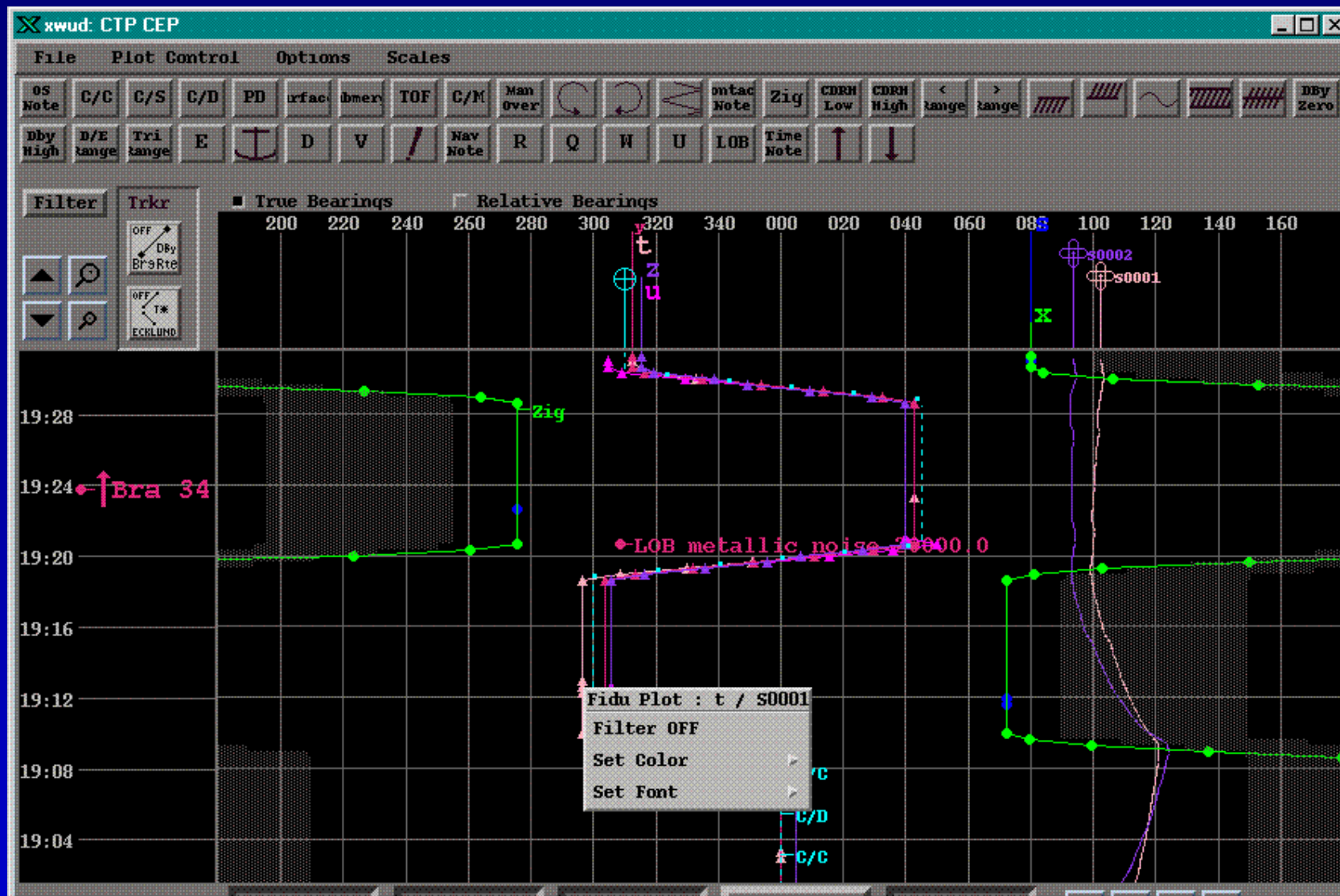
# Common Environment



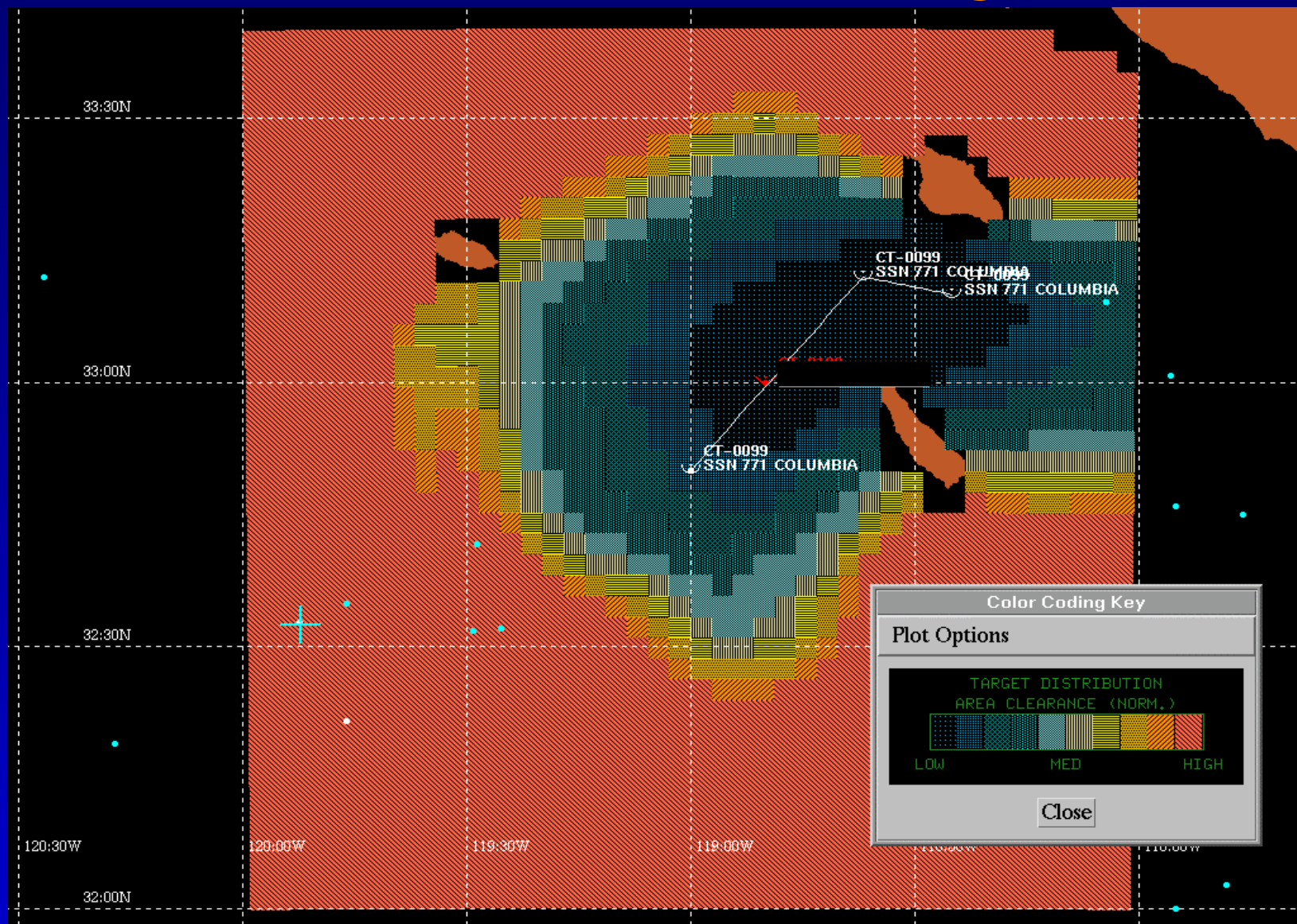




# Counter-Detection & Collision Avoidance

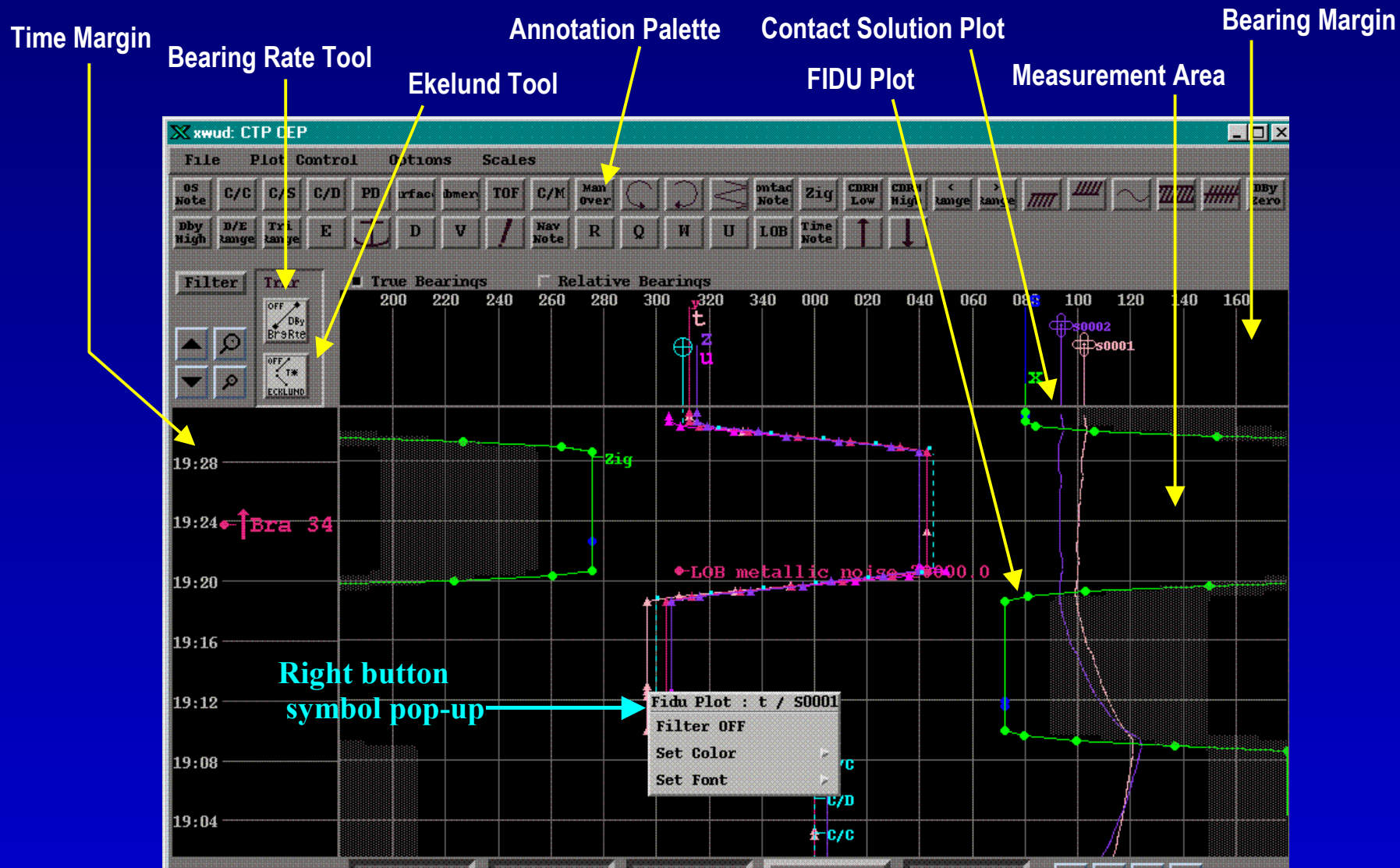


# Search Capability

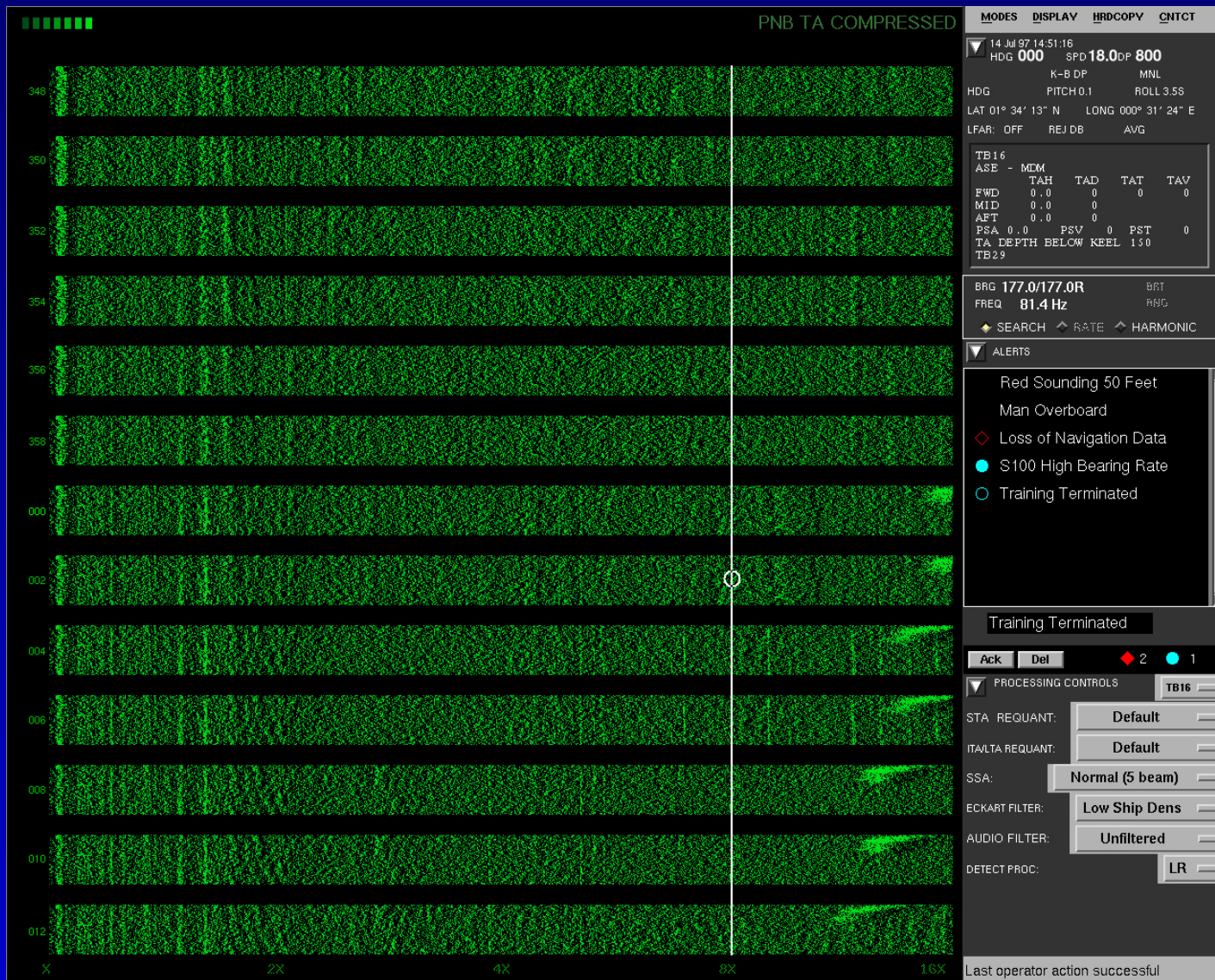




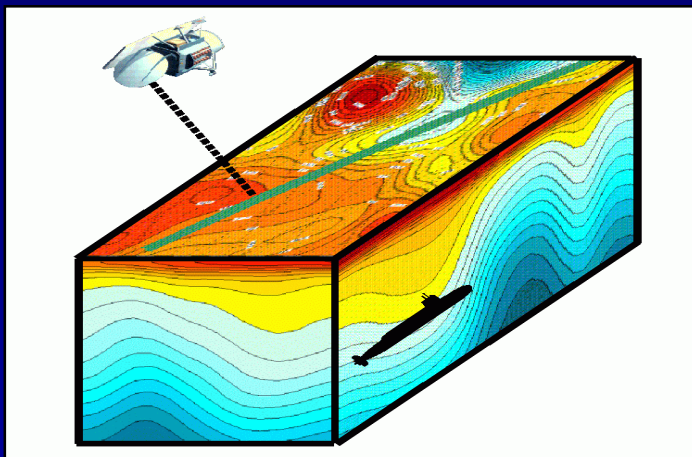
# Tactical Picture



# Detection

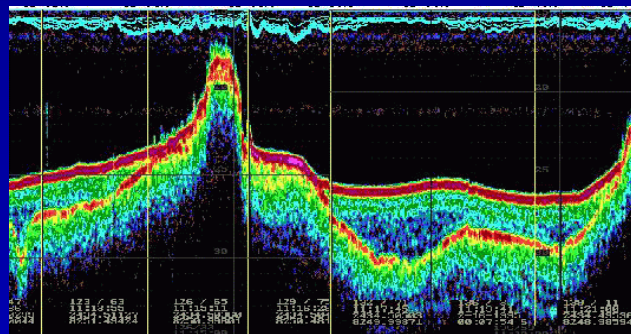


# Future SSN METOC Data Collection Exploitation



## MODAS

MODAS-LITE  
Trackline Data

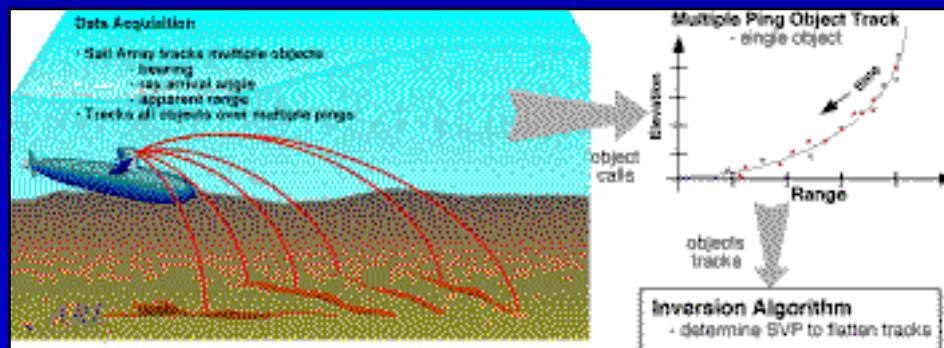


## BQN-17 SEDIMENT CLASS

Density  
Grain Size  
Strength  
Etc.

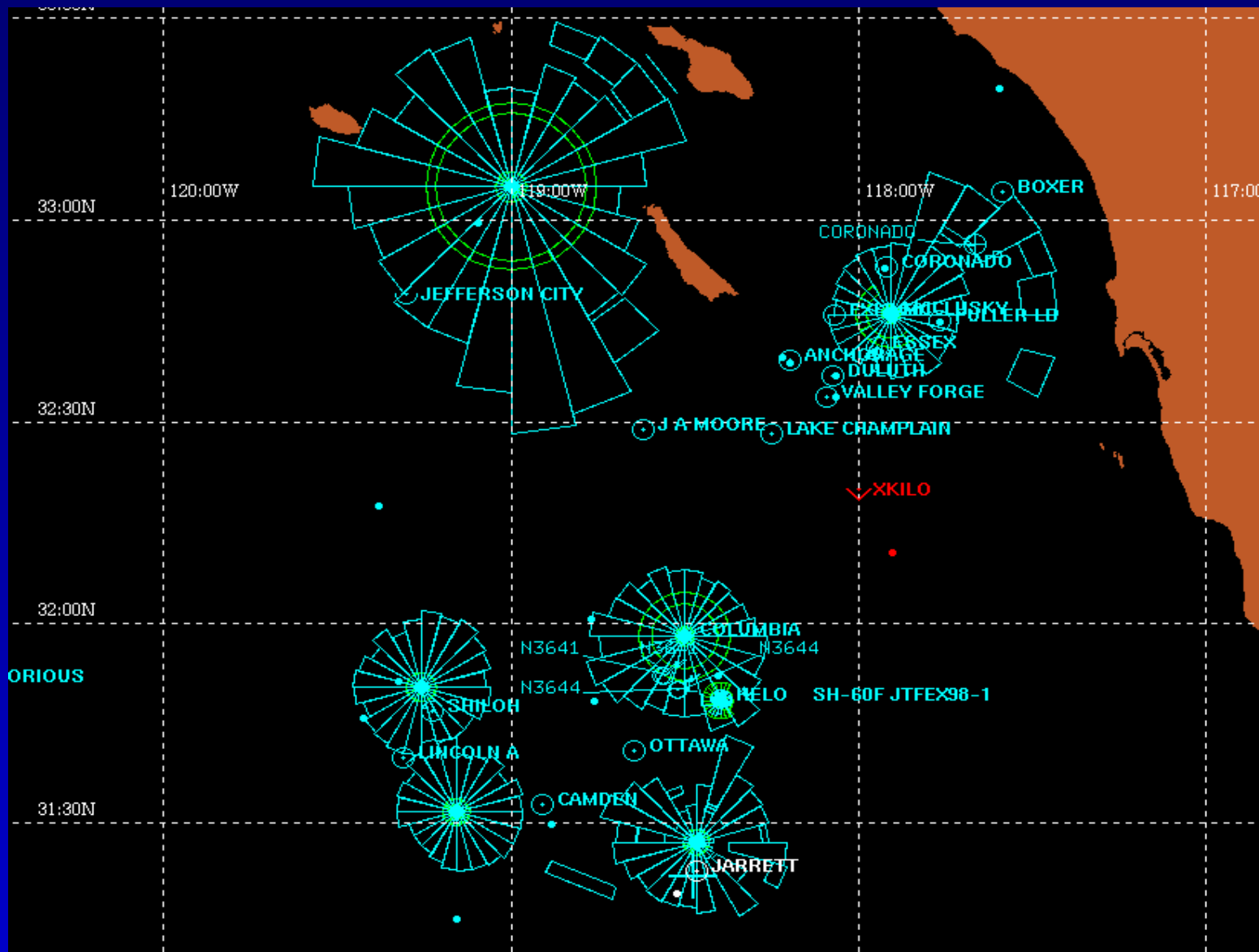
## ALS SVP Inversion

Multi-Beam  
High Frequency





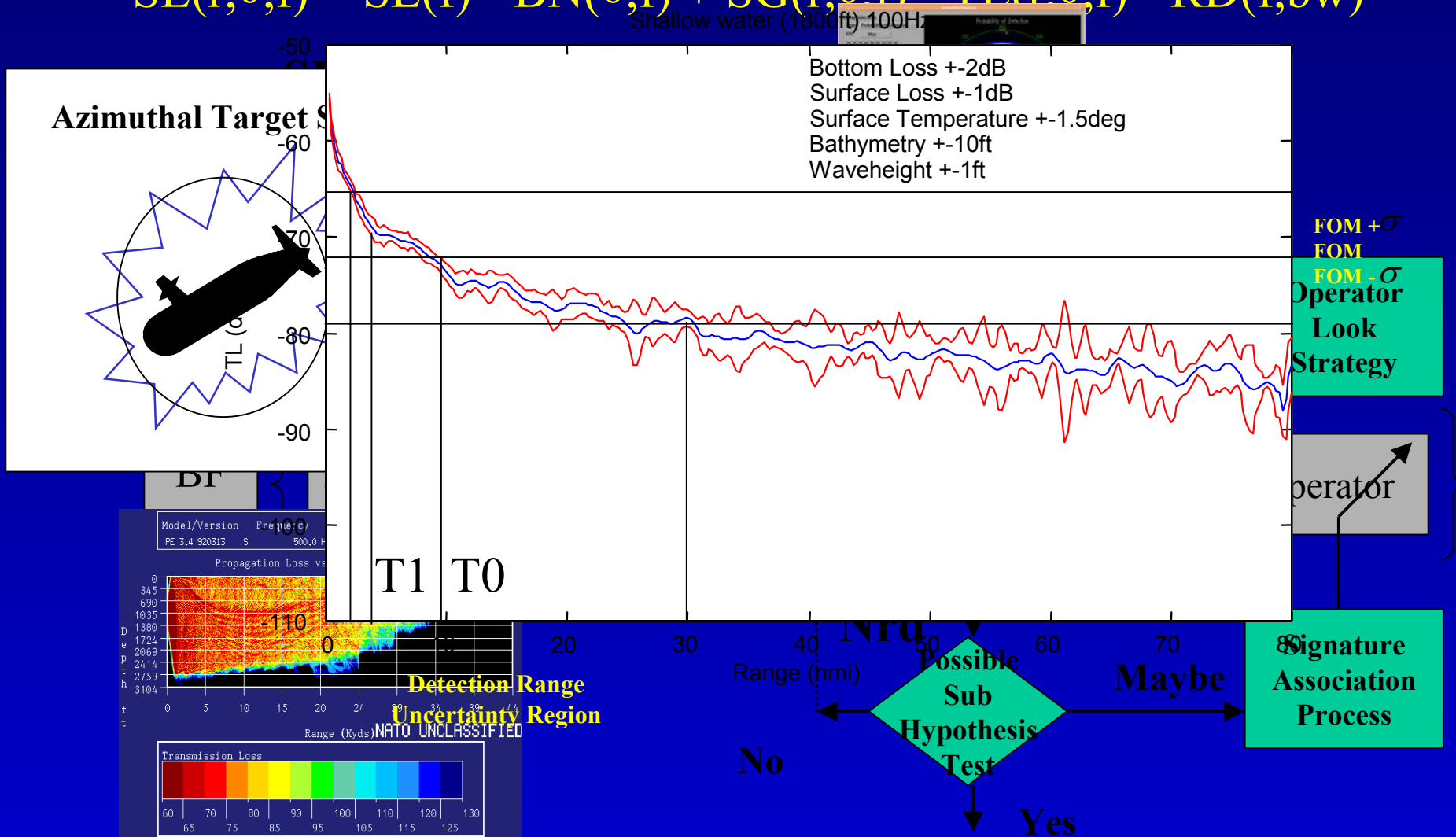
# Common Coherent Tactical Picture





# Notional Detection Block Diagram

$$SE(r, \theta, f) = SL(f) - BN(\theta, f) + SG(r, \theta, f) - TL(r, \theta, f) - RD(f, bw)$$



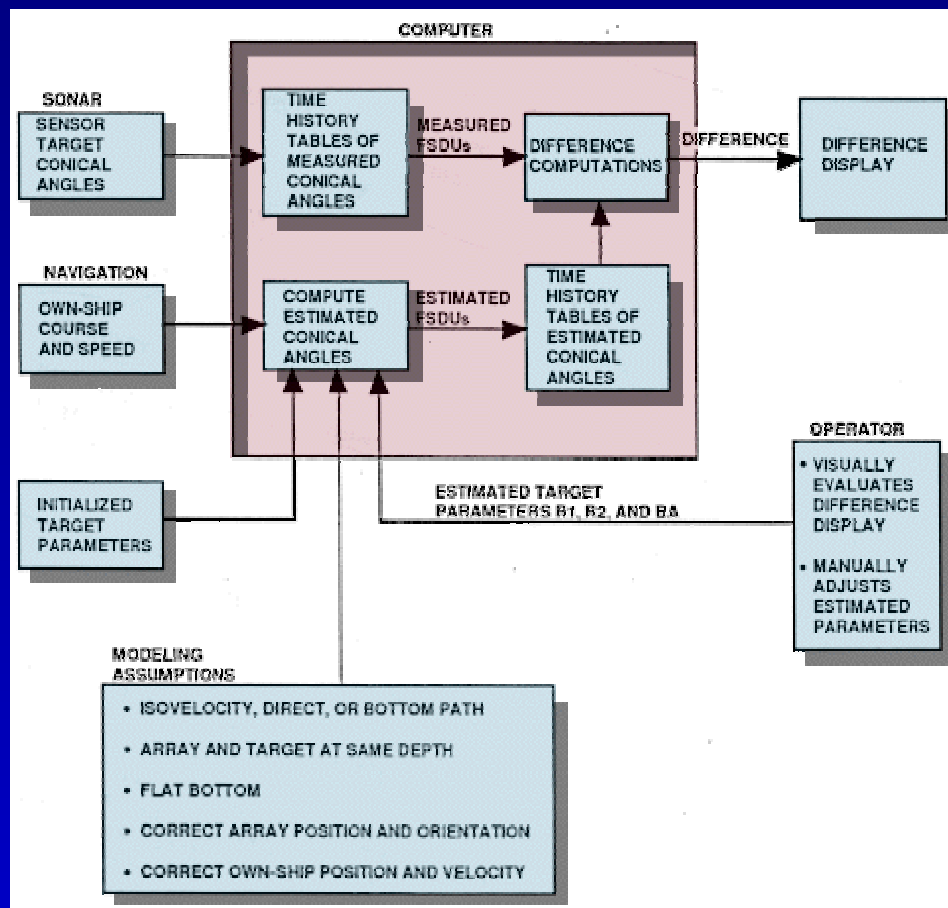


# S&T Challenges

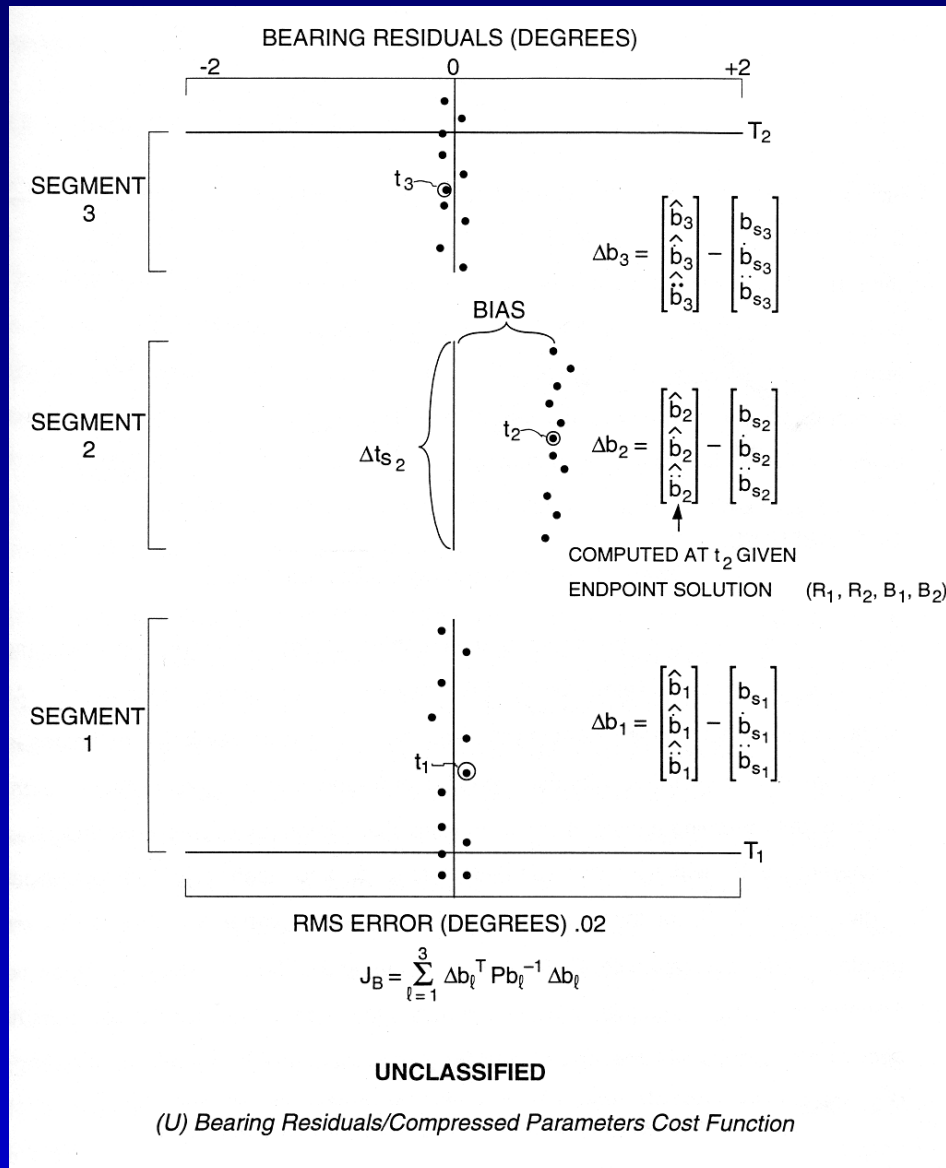
- Sonar Equation Variance Estimation
  - Source Level
  - Noise
  - TL
  - System Characteristics
  - Operator Performance
  - Visualization of uncertainty
- Sampling of Environment
  - How often?
  - Where?
  - What Parameters?
- Applicability to operational areas
- Assimilation of Sampled Data
  - Bottom Depth Samples/Grids
  - Sensor measured noise data
  - Track line sound speed data
- ASW information model
- Platform track planning
- Asset allocation optimization
- Target Localization Fusion
- Weapon Engagement
- Collaborative plan generation
- RF Comms limitations
  - 56-128 kbps

# MATE MODEL

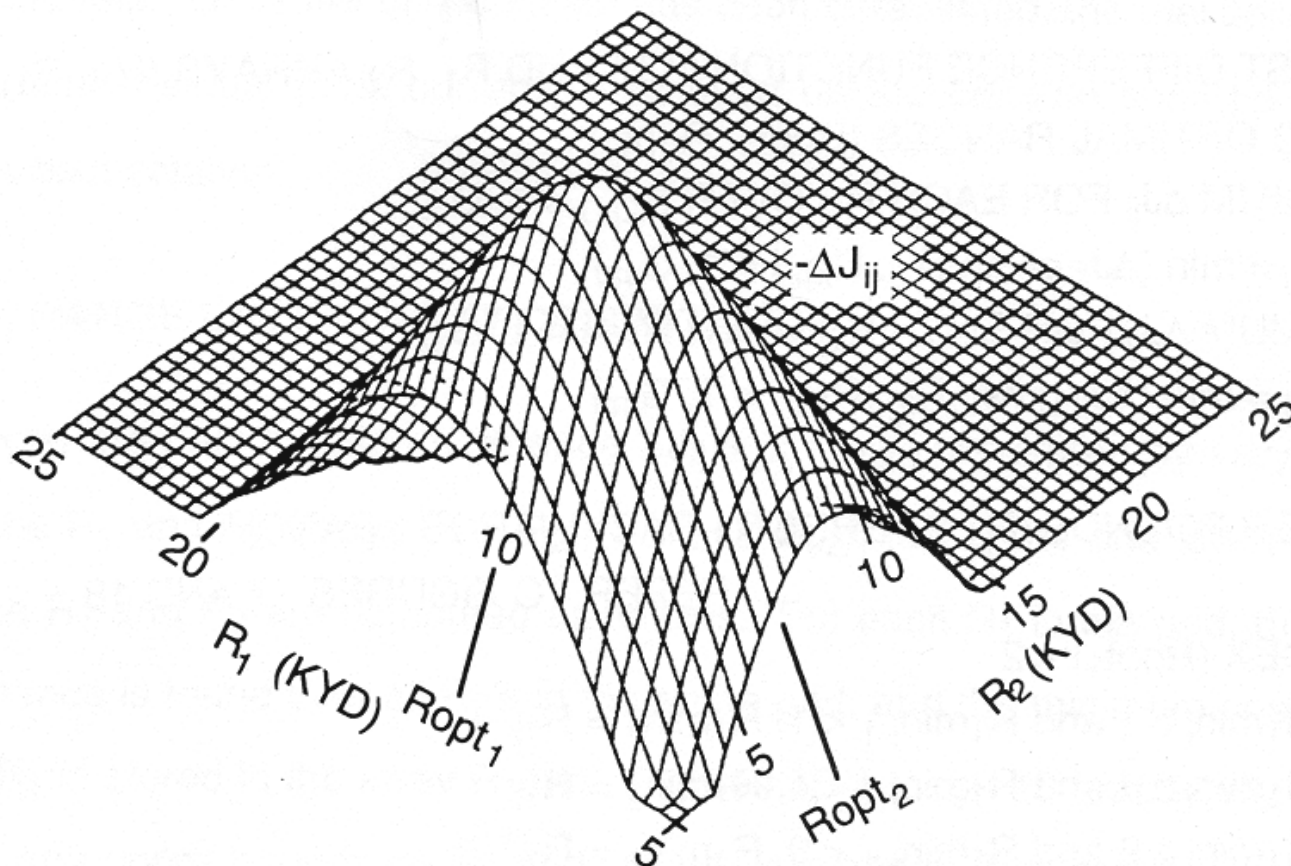
## Conical Angle



# State Estimation Error Calculations



# State Estimate Uncertainty



(U) Cost Function Difference

